Induction - Summary

MAGNETIC FLUX

$$\Phi_B = \int \vec{B} \cdot d\vec{A}$$

If surface is a plane of area *A*, and $\vec{B}$ is constant in magnitude and direction over the surface and makes an angle θ with $d\vec{A}$, then the magnetic flux is:

$$\Phi_B = \vec{B} \cdot \vec{A} = BA\cos\theta$$

FARADAY'S LAW

The magnitude of the emf ε induced in a conducting loop is equal to the rate at which the magnetic flux Φ_B through that loop changes with time.

$$\varepsilon = -\frac{d\Phi_B}{dt}$$

THREE WAYS TO CHANGE MAGNETIC FLUX

1. Change the **magnitude** of the **magnetic field**. $(\Delta \vec{B})$
2. Change the **area** of the **loop**(s) of wire. $(\Delta \vec{A})$
3. Change the **orientation** between the **area of the loop** and the **applied magnetic field**. $(\Delta\theta)$

LENZ'S LAW

The *induced emf* and *induced current* are in such a direction as to **oppose** the **change that produces them**.

[i.e. The *induced current* is in a direction that **tends to keep** the **original magnetic flux** through the loop **from changing**.]